

Application No.: 10/669,616
Amendment dated October 17, 2005
Reply to Office Action of June 15, 2005

Amendments to the Drawings:

Applicant submits a clean and marked up copy of replacement sheets 1 and 3.

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Remarks/Arguments

Claims 1-24 are in the application. Claims 1-22 have been previously presented.

Claims 23-24 are added by this amendment. Claims 1, 4, 14, 23, and 24 are in independent form.

Drawings

The drawings stand objected to because Figures 1A and 1B should be designated as prior art and because the original drawings do not include reference signs 309, 354, 356, 358, and 402. Amended drawings are attached which address the Examiner's objections and include reference numbers 309, 354, and 356. An additional correction has been made to FIG. 3 to include reference number 343.

The Examiner's remaining objections to the Drawings have been addressed by the above Amendments to the Specification. The Specification is amended only to correct typographical errors. No new matter is added by way of these amendments.

Claim Rejections 35 USC § 102

Claims 4, 5, 12 and 13 stand rejected under 35 USC 102(e) as being anticipated by US2003/0138709 A1 to Burbank et al. ("Burbank"). A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); See M.P.E.P. § 2131. Applicant submits that the reference cited by the Examiner does not set forth, either expressly or inherently, all of the elements of the rejected claims.

Claim 4 (along with dependent claims 5, 12, and 13) claims "[a] method for removing a material covering an alignment mark on a substrate, comprising: directing a charged particle beam at the material covering an alignment mark; and removing said material by charged

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particle beam sputtering without using an etch assisting gas." (emphasis added).

The Burbank reference does not specify that the sputtering is performed without an etch assisting gas. The reference fails to mention whether an etch assisting gas is used or not. Because the element is not expressly present in the reference, the claim is only anticipated if the element is inherent in the reference. *Verdegaal Bros.*, 814 F.2d at 631, 2 USPQ2d at 1053; M.P.E.P. § 2131. However, a claim limitation is inherent in the prior art only if it is necessarily present in the prior art, not merely probably or possibly present. *Rosco v. Mirror Lite*, 304 F.3d 1373, 1380, 64 USPQ2d 1676 (Fed. Cir. 2002) (emphasis added). This claim limitation is certainly not necessarily present since prior art cited in Applicant's Specification (that also predates Burbank) teaches sputtering with an etch assisting gas.

As explained in Applicant's Specification, the use of an energy beam and gas-assisted etching to remove a predetermined portion of a film covering an alignment mark "also suffers from several shortcomings that make it less suitable for mass production manufacturing."

According to paragraph [1011] of the Specification:

"First, the use of gas assisted etching necessarily requires the use of a gas-delivery system. Any energy beam system with such a gas delivery system will be more complex than a system without a gas delivery system. Greater complexity tends to reduce the reliability of such a system and make it less suitable for use in mass production. A system that requires a gas delivery system will also tend to be physically larger than a system without a gas delivery system. Smaller systems are desirable because most manufacturing takes place in a clean room, and the cost of clean room space is extremely high. Further, the gases used in this type of system are typically toxic and/or corrosive, which causes difficulty in handling and storage. Such gases can also degrade the components in the vacuum system."

Applicant's invention describes a method that avoids the problems associated with the use of an etch assisting gas while still allowing material to be removed at a rate and in a manner suitable for high-volume mass production.

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Claim Rejections 35 USC § 103

Claims 14-22

Claim 14, 15 and 18-22 stand rejected under 35 USC 103(a) for obviousness over US 2001/0027917 A1 to Ferranti et al. ("Ferranti"). Claims 16 and 17 stand rejected under 35 USC 103(a) for obviousness over Ferranti in view of U.S. Pat. No. 6,440,615 B1 to Shimizu ("Shimizu").

Claim 14 (and thus dependent claims 15 and 18-22) has been amended to more accurately claim Applicant's invention. The amended claims include limitations not found in the cited references.

Claims 6 & 7

Claims 6 and 7 stand rejected under 35 USC 103(a) for obviousness over Burbank in view of Shimizu.

As is the case for the claims discussed above, Applicant submits that the references cited by the Examiner do not set forth, either expressly or inherently, all of the elements of the rejected claims. Claims 6 and 7 are dependent on claim 4. Neither Burbank nor Shimizu teaches sputtering material covering an alignment mark without using an etch assisting gas.

Further, even if this element were taught by the references, a *prima facie* case of obviousness has still not been established because a skilled person would have had no motivation to combine the references. It is well settled that the obviousness of an invention cannot be established by combining the teachings of the prior art absent some teaching, suggestion or incentive supporting the combination. *Ex parte Haymond*, 41 USPQ2d 1217, 1219 (Bd. Pat. App. & Inter. 1996); *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). It is impermissible to use the claimed invention as an instruction manual

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or "template" to piece together isolated disclosures and teachings of the prior art so that the claimed invention may be rendered obvious.

Here, the only rationale offered by the Examiner in support of the combination of the references is that the argon ion beam (taught by Shimizu) was "conventional in the art of focused ion beam sputter etching." However, the fact that an element is known in the art does not provide a motivation to combine. There is nothing in either of these references that provides any sort of "teaching, suggestion or incentive supporting the combination."

Claims 1-3

Claims 1-3 stand rejected under 35 USC 103(a) for obviousness over Burbank in view of Ferranti and Shimizu.

Claim 1 (along with dependent claims 2 and 3) claims "[a] method for removing a material covering an alignment mark on a substrate, comprising: mounting the substrate onto a stage in a focused ion beam system, said focused ion beam system having a non-liquid metal ion source; directing an ion beam at the material covering an alignment mark, said ion beam having a beam current greater than 300 nanoamps and directed at an oblique angle relative to the surface of the substrate; and removing said material by ion beam sputtering." (emphasis added).

None of the references teaches a beam current greater than 300 nanoamps. As noted by the Examiner, Burbank does not disclose any details of the focused ion beam. Shimizu teaches focused ion beams with beam currents from 10 to 350 pA. Ferranti only teaches a 1 to 60 keV ion beam and says nothing about beam current. Because it is possible to have a beam current that is less than 300 nanoamps with a 1 to 60 keV ion beam, this limitation is not taught by Ferranti.

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Further, none of the references teaches an ion beam directed at an oblique angle relative to the surface of the substrate. Neither Burbank nor Shimizu mentions anything about the ion beam incidence angle. Although in the apparatus taught by Ferranti, there will be some minute changes in beam incidence angle resulting from deflection of the ion beam, those changes would be so small that the beam incidence angle would still be effectively normal (i.e. 90 degrees). No skilled person would understand Ferranti to teach an ion beam "directed at an oblique angle relative to the surface of the substrate."

Also, a *prima facie* case of obviousness has not been established because a skilled person would have had no motivation to combine the references. The Examiner has not pointed to any valid "teaching, suggestion or incentive supporting the combination."

The Examiner states that it would have been obvious to modify Burbank to use the FIB system of Ferranti "because of the knowledge that it is a conventional focused ion beam system." As discussed above, the mere fact that these elements were known in the prior art is not sufficient to provide a motivation to combine the references.

The Examiner also states that it would have been obvious to combine the argon ion beam in Shimizu with Burbank because "gallium and argon beams are art recognized equivalents." While Shimizu does suggest that argon ions can be used for material removal, the reference goes on to teach that "[t]he larger an ion's atomic number is, the higher the sputtering rate therefore becomes." Shimizu, col. 8, lines 31-33. Since gallium has an atomic number that is higher than argon, Shimizu actually teaches away from using an argon ion beam for rapid material removal.

Claims 8-11

Finally, claims 8-11 stand rejected under 35 USC 103(a) for obviousness over Burbank in view of Ferranti. As is the case for the claims discussed above, Applicant submits that the

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references cited by the Examiner do not set forth, either expressly or inherently, all of the elements of the rejected claims. Claims 6 and 7 are dependent on claim 4 and are thus allowable for the reasons discussed above. Additionally, claims 8-11 contain additional limitations not found in the cited references.

As discussed above, Ferranti does not teach a charged particle beam directed at an oblique angle relative to the surface of the substrate. Although in the apparatus taught by Ferranti, there will be some minute changes in beam incidence angle resulting from deflection of the ion beam, those changes would be so small that the beam incidence angle would still be effectively normal (i.e. 90 degrees). In contrast, Applicant's specification provides that a tiltable stage or column can be used so that the ion beam can be directed at angles less than 90 degrees. Certainly nothing in Ferranti (or Burbank) teaches using a beam angle of 40 to 80 degrees. Further, nothing in Ferranti teaches a beam current of 300 to 20000 nanoamps (as claimed by claim 10) or 1500 to 500 nanoamps (as claimed by claim 11). Ferranti only teaches a 1 to 60 keV ion beam, and beam currents of 300 to 20000 nanoamps are not necessarily present with a 1 to 60 keV ion beam.

Any Remaining Claims

Applicant submits that the remaining claims, being dependent from claims that are allowable for reasons stated above, are also allowable. Accordingly, Applicant requests that the objections to these remaining claims also be withdrawn.

New Claims

Applicant adds claims 23-24 in order to more completely claim the invention. Claim 23 is supported for example, in paragraphs [1026] and [1040] to [1049] of the specification. And claim 24 is supported for example, in paragraph [1039] of the specification.

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Conclusion

Applicant submits that all claims in the application are now in condition for allowance, and Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,



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Annotated Marked-Up Drawing

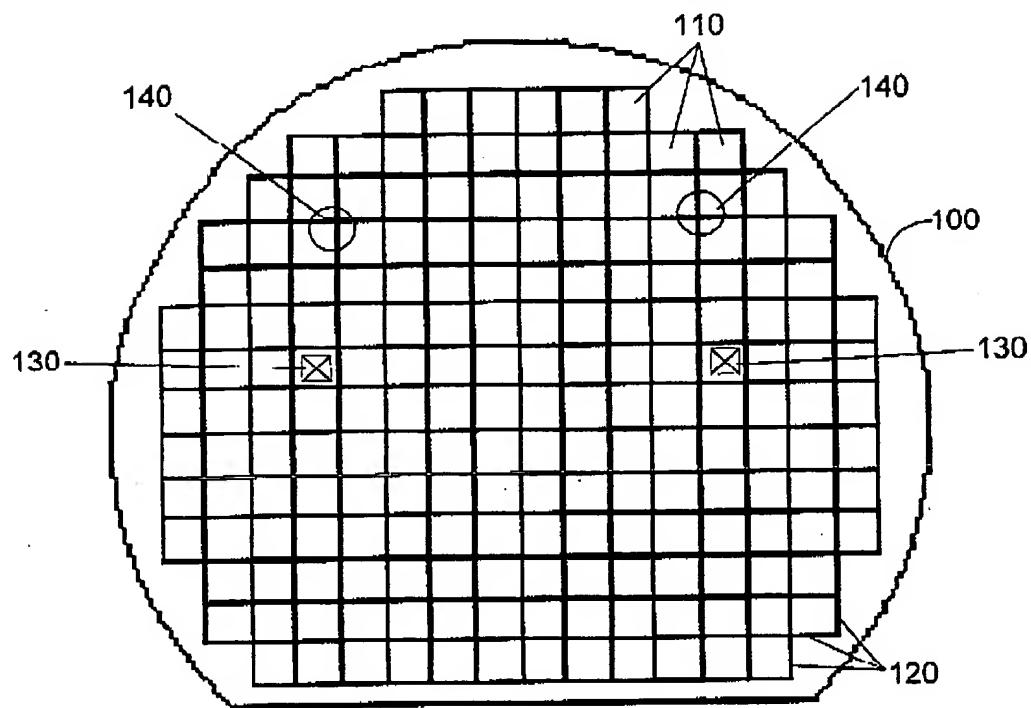


FIG. 1A
Prior Art

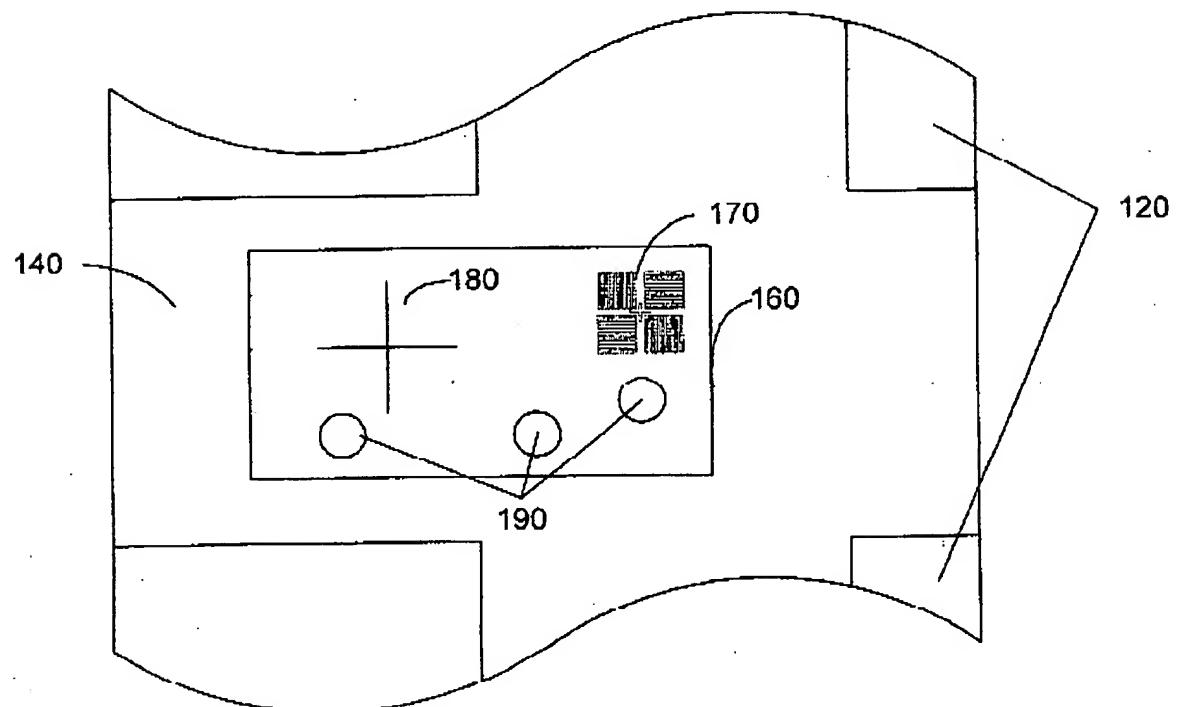


FIG. 1B
Prior Art

Annotated Marked-Up Drawing

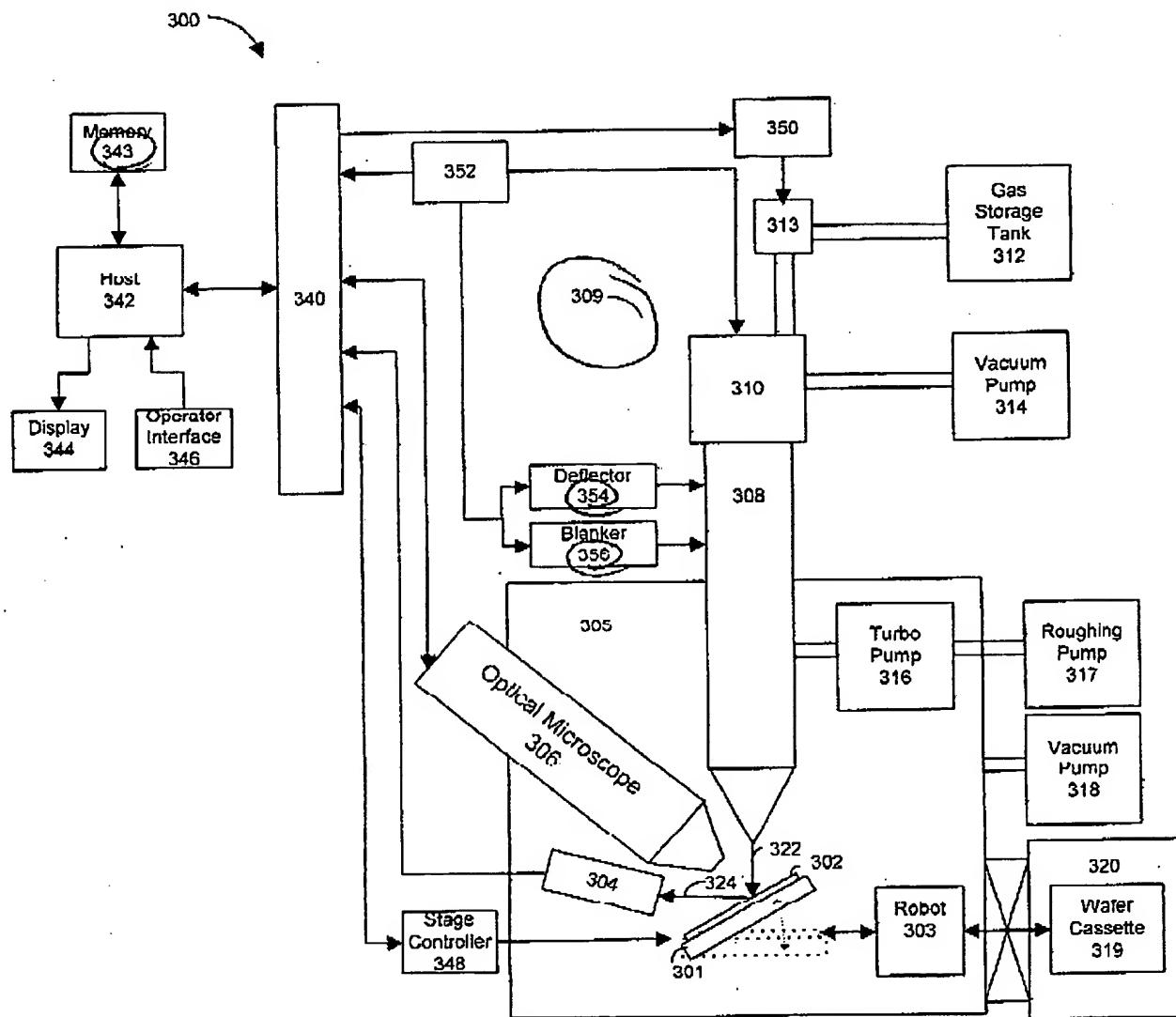


FIG. 3